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ABSTRACT

Multiple regression analysis was used to examine scores on the Pharmacy College Admission Test (PCAT) and pre-pharmacy grade point averages (GPAs) as predictors of academic success in pharmacy school. Separate analyses were made for White (n=471), Black (n=54), and Asian (n=96) subgroups, as well as for the total sample of 643 students who entered the pharmacy school at a large eastern university between 1975 and 1986. The results indicate that the predictors differed significantly in importance for the three subgroups. In a separate analysis, the eight variables within the Noncognitive Questionnaire were examined with respect to their predictive power when included in an equation with pre-pharmacy GPA and PCAT total score. One of the non-cognitive variables--understanding and dealing with racism--significantly increased the overall R squared value. It should be noted that the sample size for this study was quite small, limiting both the validity and generalizability of the findings. The small sample size also undermined the attempt to distinguish results across racial groups for the non-cognitive variables. Implications for educators and admissions personnel are discussed. Two data tables provide demographic characteristics of the subjects and results of multiple regression analyses. (TJH)

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# PREDICTING SUCCESS OF PHARMACY STUDENTS USING TRADITIONAL AND NONTRADITIONAL MEASURES BY RACE

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# Predicting Success of Pharmacy Students Using Traditional and Nontraditional Measures by Race

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## Summary

Multiple regression analysis was used to examine PCAT scores and prepharmacy GPA as predictors of academic success in pharmacy school. Separate analyses were conducted for white, black and Asian subgroups, as well as for the total sample. The results indicate that the predictors differ significantly in importance for the three subgroups.

In a separate analysis, the eight noncognitive variables proposed by Sedlacek (1982) are examined with respect to their predictive power when included in an equation with prepharmacy GPA and PCAT total score. One of the noncognitive variables, "understanding and dealing with racism," significantly increased the overall R squared value. Implications for educators and admissions personnel are discussed.

Making predictions about which students will succeed in college has long been a topic of interest in higher education. Since the development of the Pharmacy College Admission Test (PCAT) in 1974, many institutions have begunto use this instrument in conjunction with other measures, such as GPA, to make these predictions. Several studies have examined the predictive power of the PCAT, using pharmacy school GPA as the dependent variable (Belmonte and Strickland, 1978; Jacoby, Plaxco, Kjerolft, and Weinert, 1978; Sisson and Dizney, 1980; Kotzen and Entrekin, 1977; Liao and Adams, 1977). These studies have found that the use of PCAT scores along with prepharmacy GPA resulted in significantly greater levels of predictive power than the use of the prepharmacy grades alone. Jacoby et al also obtained a significant increase in predictive power by including a variable which they labeled "source." This variable was a measure of the "quality" of the institution attended before admittance to pharmacy school, multiplied by the number of years spent at that institution.

It has become evident, however, that measures of GPA and PCAT scores provide for limited prediction of either GPA or graduation rates. This is especially true in the case of minority students, for whom college admissions tests are not as useful in predicting success in college as they are for white students (Bailey, 1978). There appear to be other variables which are related to success in college. Factors such as motivation, interest, perseverance, and social support have long been hypothesized to affect both the grades and the persistance rates

of college students. These factors have been collectively referred to in the literature as noncognitive variables, and evidence of their relationship to academic success has been established by several studies (Astin, 1975; Pascarella and Chapman, 1983; Pascarella, Duby, and Iverson, 1983; and Tinto, 1975).

This line of reasoning has led to the development of the Noncognitive Questionnaire (NCQ) by Sedlacek (1982) and Tracey and Sedlacek (1984). The NCQ was designed to measure eight noncognitive dimensions which previous research had suggested were related to academic success. These eight noncognitive variables were: (1) positive self-concept, (2) realistic self-appraisal, (3) ability to understand and deal with racism, (4) preferring long range to short term goals, (5) availability of a strong support person, (6) successful leadership experience , (7) demonstrated community service, and (8) knowledge acquired in a field. These variables have been found to correlate significantly with GPA and graduation rates for both black and white university students for up to six years after initial matriculation (Tracey and Sedlacek, 1984; 1985; 1987). Boyer and Sedlacek (in press) found these variables to be predictive of GPA and persistence rates for international students. White and Sedlacek (1985) found the NCQ to be related to the academic success of specially admitted students. In all cases , use of the NCQ has been found to add significantly to the prediction equations for both college GPA and persistence rates, even with the inclusion of high school GPA and SAT scores.

Those involved in professional school admissions have become interested in using the NCQ in their admissions processes. The Association of American Medical Colleges (Prieto, Quinones, Elliot, Goldner, and Sedlacek, 1986; Sedlacek and Prieto, 1982) and the Mexican-American Legal Defense and Educational Fund (Brown and Marenco, 1980) have recommended that the use of noncognitive variables in medical and law school admissions be increased, and that the use of the MCAT and LSAT examinations be deemphasized. The recent decline in the number of schools requiring the (PCAT), along with an increase in the number of minority applicants suggests that the NCQ may have some utility in pharmacy school admissions. The purpose of this study was to determine whether use of the traditional predictors (PCAT and GPA) resulted in differential prediction equations for white and minority students, and whether use of the NCQ resulted in a significant increase in predictive power over traditional predictors.

## METHOD

### Sample and Procedures

Subjects were 643 students who entered the pharmacy school at a large eastern university school between 1975 and 1986. Table 1 provides a summary of the demographic characteristics of these students.

Table 1

Demographic Characteristics of Pharmacy School Students 1975-1986

| Characteristic | N (643) | % of total |
|---|---|---|
| Sex | | |
| Male | 282 | 44 |
| Female | 361 | 56 |
| Race | | |
| White | 471 | 73 |
| Black | 54 | 8 |
| Asian | 96 | 15 |
| Other | 22 | 3 |
| Age | | |
| 18-20 | 242 | 38 |
| 21-25 | 276 | 43 |
| 26-30 | 66 | 10 |
| > 31 | 25 | 4 |
| Other | 34 | 5 |

Of these students, only those admitted in 1985 and 1986 were administered the NCQ as part of the admissions process. Of these, only 55 were involved in analyses due to incomplete data in other areas. This group of students was used in analyses involving the eight NCQ factors.

Two separate analyses were completed. The first involved the entire sample (n=643) and used stepwise multiple regression to predict overall first year pharmacy school GPA from overall prepharmacy GPA , prepharmacy required GPA, prepharmacy chemistry and math GPAs, the PCAT raw scores from the verbal ability, reading comprehension, biology, chemistry, and quantitative ability subtests, and source. Source is a computed variable which multiplies the rating assigned to each prepharmacy institution

attended by the number of years spent at that institution. Ratings of one,two,three, and four are assigned to community colleges, other state colleges, other four year institutions , and other campuses of the parent university, respectively. The multiple regression was then repeated for the white , black, and Asian subgroups separately.

The second analysis involved the 55 students for whom complete data, including NCQ forms, were available. This analysis was also a stepwise multiple regression with overall pharmacy GPA as the dependent variable. Overall prepharmacy GPA, PCAT total score, and scores on the eight noncognitive variables were entered as predictor variables.

## RESULTS

Results of the first analysis are summarized in Table 2. This analysis indicated that, for the total sample, prepharmacy required GPA and PCAT reading comprehension, biology and verbal aptitude scores, and source had the strongest association with pharmacy school GPA. PCAT verbal ability scores were negatively correlated with pharmacy school GPA while the other variables were positively correlated. This analysis resulted in a multiple R of .66, and an R squared of .44. For the analyses done by racial group, combinations of these same variables still entered the equation, but in different orders. For the white students, prepharmacy required GPA was again the strongest predictor, followed by the PCAT biology score, source, and the PCAT reading comprehension score. For black students, only the PCAT reading

comprehension score and required prepharmacy GPA, in that order, entered the equation. The analysis for the Asian group produced the same results as that for the black group, with the addition of source as a third predictor. Source, however, emrged as a negative predictor for Asian students, in contrast to its role in the analyses for the white and total groups.

The purpose of the second analysis was to assess how well the eight noncognitive variables predict pharmacy school GPA when used in conjunction with PCAT scores and prepharmacy school GPA. In this analysis, only the inclusion of prepharmacy overall GPA and factor three, "understanding and dealing with racism," resulted in significant increases in predictive power. The inclusion of factor three, "understanding and dealing with racism," resulted in an increase of .07 in the R squared value (from .28 to .35). This increase was significant at the .01 level. This indicates that the use of the noncognitive variable "understanding and dealing with racism" contributed significantly more to the explanation of pharmacy school GPA than the use of the PCAT total score alone. This variable, along with prepharmacy overall GPA, explained 35% of the variance in pharmacy school GPA.

Table 2

Results of Multiple Regression Analyses for White, Black, Asian and Total Samples

| Variable entered | R | Rsq. | Rsq.change | F* | Beta |
|---|---|---|---|---|---|
| **Total sample (n=643)** | | | | | |
| Required GPA | .55 | .30 | .30 | 209.34 | .47 |
| PCAT Reading Comp. | .64 | .41 | .11 | 170.68 | .31 |
| Source | .65 | .43 | .02 | 121.16 | .10 |
| PCAT Biology | .66 | .44 | .01 | 93.12 | .12 |
| PCAT Verbal | .67 | .45 | .01 | 75.89 | -.09 |
| **White Sample (N= 471)** | | | | | |
| Required GPA | .57 | .32 | .32 | 169.13 | .50 |
| PCAT Biology | .63 | .40 | .08 | 121.04 | .12 |
| Source | .66 | .43 | .03 | 90.18 | .18 |
| PCAT Reading Comp. | .67 | .45 | .02 | 74.12 | .19 |
| **Black sample (n=54)** | | | | | |
| PCAT Reading Comp. | .58 | .34 | .34 | 22.12 | .57 |
| Required GPA | .64 | .41 | .07 | 14.65 | .27 |
| **Asian sample (n=96)** | | | | | |
| PCAT Reading Comp. | .53 | .28 | .28 | 25.99 | .50 |
| Required GPA | .67 | .45 | .17 | 27.30 | .38 |
| Source | .70 | .49 | .04 | 20.73 | -.21 |

* All F ratios were significant at the .01 level.

## DISCUSSION

The results of this study support an increase in predictive power gained by using at least one of the noncognitive variables, "understanding and dealing with racism," in addition to the PCAT scores. It should be noted that the sample size in this case was quite small, which limits both the validity and generalizability of these findings. The small sample size also precluded running separate analyses for the different racial groups. Based on the findings of Tracey and Sedlacek (1984; 1986; 1987), who obtained differential results in predicting retention rates for black and white students using the noncognitive variables, this type of analysis would clearly be of interest.

The existence of differences between black and white students is supported in this study by the results of the initial analyses, which did not include the noncognitive variables. These analyses obtained differential results for black and white students in terms of the variables which are related to their pharmacy school GPA. For white students, prepharmacy school GPA, PCAT biology and reading comprehension scores, and source were found to be significant predictors.

For black students, only PCAT reading comprehension and scores and prepharmacy school required GPA were significant predictors of pharmacy school GPA. For these students, PCAT reading comprehension scores had the highest correlation with pharmacy school GPA. Similar results were obtained for the Asian students. These results seem to indicate that the ability to read and understand written English, as meaured by the PCAT reading

comprehension score, is more important in the pharmacy school achievement of black and Asian students than for white students.

The regression analysis for Asian students also indicated that the variable source has a negative relationship with academic success for these students. This is in contrast to the positive relationships found by Jacoby et al (1978) for students in general, and in the analyses for the white and total groups in this study. In attempting to account for this finding, it must be kept in mind that this variable is computed by multiplying the quality rating of and institution by the number of years spent at that institution. For this computation, community and state colleges receive lower ratings than do four year institutions outside the state. The reason for this is that community and state colleges may have lower admission standards than other institutions. Although many students may attend community and state colleges for this reason, it is also probable that students attend them because of their lower cost and proximity to their homes. This analysis indicates that, at least for Asian students, attendance at state and community colleges is associated with higher, rather than lower, levels of academic success.

Given the somewhat mixed results found in this study regarding prediction of pharmacy school success for black, Asian and white students, it is clear that more research needs to be done in order to clarify the reasons for these discrepancies. Future research should include separate studies of each racial group, and should also examine the value of using instruments such as the NCQ in contributing to the ability to understand and

predict academic success in pharmacy school.

However, it is also clear from this study and others in the literature that predictors do not work in the same way for different racial groups. In admissions prediction systems should apply predictors differentially based on race if the admissions process is to be fair and equitable.

References


Astin, A.W. (1975). Preventing students from dropping out. San Francisco: Jossey-Bass.

Bailey, R.N. (1973). Minority admissions. Lexington, Mass.: Heath.

Belmonte, A.A. & Strickland, E.I. (1978). Prediction of academic success using selected variables. American Journal of Pharmaceutical Education, 42,122-124.

Boyer, S.P. and Sedlacek, W.E. (in press). Noncognitive predictors o academic success for international students: A longitudinal study. Journal of College Student Development.

Brown, S.E. and Marenco, E., Jr. (1980). Law school admissions study. San Francisco: Mexican-American Legal Defense and Educational Fund.

Jacoby,K.E., Plaxco, W.B., Kjerolft, K., & Weinert, A.B. (1978). The use of demographic variables as predictors of success in pharmacy school. American Journal of Pharmaceutical Education, 42, 4-17.

Kotzen, J.A. & Entrekin, D.N. (1977). Validity comparison of PCAT and SAT in the prediction of first year GPA. American Journal of Pharmaceutical Education, 41, 4-7.

Liao, W.C. & Adams, J.P. (1977). Methodology for the prediction of pharmacy students' academic success: Preliminary aspects. American Journal of Pharmaceutical Education, 41, 124 - 127.

Pascarella, E.T. & Chapman, D.W. (1983). A multi-institutional path analytic validation of Tinto's model of college withdrawal. American Educational Research Journal,20, 87-102.

Pascarella, E.T. , Duby, P.B., & Iverson, B.K. (1983). A test and reconceptualization of a theoretical model of college withdrawal in a commuter institution setting.Sociology of Education, 56, 88-100.

Prieto, D.O., Quinones,E., Elliot, P.R., Goldner, A.M. & Sedlacek, W.E. (1986). Simulated minority admissions exercise Washington, D.C.: Association of American Medical Colleges.

Sedlacek, W.E. (1982). The validity and reliability of a noncognitive measure of minority student retention. Counseling Center Research Report #3-82. College Park: University of Maryland Counseling Center.

Sedlacek, W.E.& Prieto, D.O. (1982). An evaluation of the Simulated Minority Admissions Exercise. Journal of Medical Education, 57,119-120.

Sisson, H.E. & Dizney, H.F. (1980). The predictive validity of the pharmacy college admission test as compared with that of other academic predictors. Educational and Psychological Measurement, 40, 425-429.

Tinto, V. (1975). Dropouts from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45, 89-125.

Tracey, T.J & Sedlacek, W.E. (1934). Noncognitive variables in predicting academic success by race. Measurement and Evaluation in Guidance, 16, 171-178.

Tracey, T.J & Sedlacek, W.E. (1985). The relationship of noncognitive variables to academic success: A longitudinal comparison by race. Journal of College Student Personnel, 26, 405-410.

Tracey, T.J. & Sedlacek, W.E. (1987). Prediction of college graduation using noncognitive variables by race. Measurement and Evaluation in Counseling and Development, 19, 177-184.

White, T.J. & Sedlacek, W.E. (1985). Noncognitive predictors of grades and retention of specially admitted students. Journal of College Admissions, 19, 20-23.